EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Final, Summer 2020

Course:	**CSE246 (Algorithms), Section - 1**
Instructor:	**Taskeed Jabid**
Full Marks:	**25**
Time:	**1 Hour and 15 Minutes**

Note: There are SIX questions, answer ALL of them.
In some question, you need to choose some input data. I expect that no input data set will be same with any other script. I hope it is not too much expectation.

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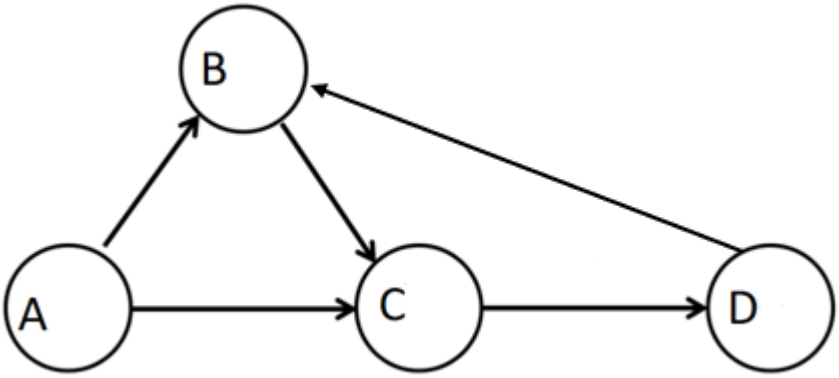
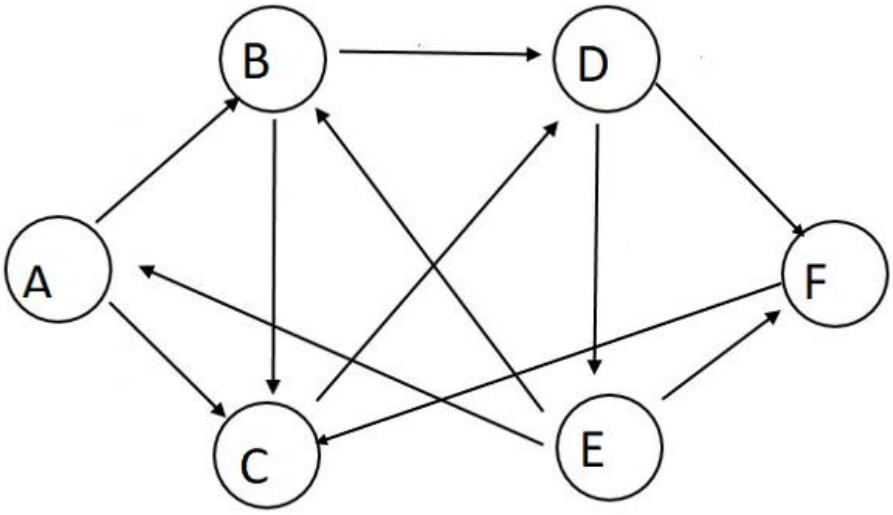
1. Assign weight of the edges of the following graph from the set of integers ranging from -10 to 10. [Ensure at least two edge's cost is negative]. Run the Bellman-Ford (two steps) shortest path algorithm on the following graph, starting from vertex A. Specifically, fill in the following table below according the steps of the algorithm.



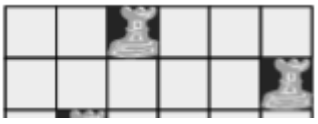
Iteration/Vertex	A	B	C	D	E	F
0	0	Infinity	Infinity	Infinity	Infinity	Infinity
1						
2						

2. Assign weight of the edges of the following graph from the set of integers ranging from 1 to 15. Run the Dijkstra shortest path algorithm on the following graph, starting from vertex A. Specifically, fill in the following table below according to the steps of the algorithm.



Iteration/Vertex	A	B	C	D	E	F
0	0	Infinity	Infinity	Infinity	Infinity	Infinity
1						
2						
3						
4						
5						
6						

3. Consider the 6-Queens problem. That is, the problem of placing 6 Queens on a hypothetical 6×6 chessboard so that no two Queens can attack each other. Draw the remaining search state space tree explored by this algorithm considering first two steps are already known as shown in the following figure.



4. Let S be the set of points {A(3, 2), B(4,5), C(2, 1), D(2, 4), E(2, 3), F(4, 2), G(?, ?), }. [Fill the last point with your own choice of input]. When the Graham Scan code run on this data, what is the initial sorting and what is the history of the stack?
5. Given the following Prim's MST pseudocode, suppose you missed or forgot to implement the highlighted statements. Can you able to MST value and/or MST tree? Explain/Justify your answer.

```
PRIM(G, w, r)
Q = ∅
for each u ∈ G.V
    u.key = ∞
    u.π = NIL
    INSERT(Q, u)
DECREASE-KEY(Q, r, 0)        // r.key = 0
while Q ≠ ∅
    u = EXTRACT-MIN(Q)
    for each v ∈ G.Adj[u]
        if v ∈ Q and w(u, v) < v.key
            v.π = u
            DECREASE-KEY(Q, v, w(u, v))
```

6. Write down the time complexity of the following
    a. Worst time complexity of Rabin-Karp algorithm
    b. Best time complexity of Rabin-Karp algorithm
    c. Worst time complexity of Floyd-Warshall algorithm
    d. Best time complexity of Floyd-Warshall algorithm
    e. Average time complexity of Graham Scan algorithm